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Landscape ecology and the destiny of geography

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Landscape ecology is a rather new phenomenon, with roots in central Europe mainly back to the second world war, spreading rapidly over the rest of the world from the middle of the 80ties, with the first textbook in English from 1984.

Already at the historical first international congress on Landscape Ecology in Veldhoven in 1981, much attention was paid to its history, by asking the old Ernst Neef to give a main speech on "Stages in the development of landscape ecology" (Neef, 1982).

In the first edition of Naveh and Lieberman's textbook from 1984 the first chapter was devoted to the evolution of landscape ecology. In the 2nd edition a supplement on recent development in Landscape Ecology gave a detailed description of the rapid spread from Europe to the rest of the world since the mid 80's. The history of landscape ecology that Zev Naveh has presented in his paper to this seminar is mainly based on this 2nd version of his textbook (Naveh & Lieberman, 1994). And since I suppose, that you have written the text, I will not repeat it here.

Other main contributions have been published by I. Zonneveld (Zonneveld, 1990), K.-F. Schreiber (Schreiber, 1990), and R. T. T. Forman (Forman, 1990) in the collection 'Changing Landscape: An ecological Perspective' (Zonneveld & Forman, 1990).

In the IALE-Bulletin many national reports on the development of landscape ecology in different countries have been published, showing a variety of entrances and different degrees and types of integration between regions.

In the following I will add something to this history, but allow me first to put the simple question:

Why already pay so much attention to the history of landscape ecology?

Is it just to give an introduction of our roots for newcomers?

Is it to present central references to be studied, if one will move more deeply into the heart of landscape ecology?

Or is it to facilitate the communication between different disciplines, working on a common project under the title 'landscape ecology' by showing how it already has proved possible?

Certainly we can postulate such practical reasons: But it would not be quite honest: As Zonneveld states it, to be recognised as a certain field of science distinct from others a science needs a paradigm and a network of researchers (Zonneveld, 1990): We could add, that it's also a part of the recognition to produce the history both of the paradigm and the network and to get this history recognised especially in the scientific community. I emphasise: to produce it: History is not just facts about the past: It is an interpretation related to the situation and interests of certain groups at the present time. I think we have to accept, that producing the history of Landscape Ecology, we interpret the past in a way suitable for our goals, that is using it to confirm a dominating or wished paradigm, and to confirm a certain interpretation of the existence of a strong and relevant network.

1 The wished recognition is at least threefold:

It is a question of an internal matter among the network: Do we have a common paradigm, and if not, which one shall dominate, and how does this domination relate to the network.

It is also a question of our external scientific relations: How to convince the existing scientific community, including the existing scientific division of labor within it, that we have a unique role to play.

Finally it is a question of our relation to the surrounding society: What is, and should be the function of the science in the society and what is the relation between this function and the role in the division of labor among the sciences?

Formulating a history of landscape ecology is also to give arguments for certain types of wished recognition within these different levels.

For the individual scientist, as well as for groups of scientists these different types of recognition are of utmost importance. A physicist will never have problems of justifying his status, although it can be just as difficult clearly to define physics as landscape ecology. But due to the missing recognition, a landscape ecologist constantly has to explain his/her role - like geographers - and I will come back to that.

I stress these facts, because I am a little afraid that within the last 5 years we have already formulated a more or less official history of landscape ecology, without really having discussed in details, if it is the right way of doing it.

What in fact has happened, is, that a rather narrow central European landscape ecology based on the co-operation between a geo-ecology mainly developed by physical geographers and a biologically oriented system-ecology has been widened to a transdisciplinary all-embracing co-operation on the study of landscapes and their use, that includes planning, cultural and esthetical aspects. Such holistic ambitions are not new, and many scientists engaged in a more narrow landscape ecology have at the same time been interested in planning problems and social aspects of the landscape as well. The new is, that these ambitions are united into one discipline, and that it is now called landscape ecology. Personally I am satisfied with this development, and as I will briefly tell you about in the end of my lecture, we try to ensure such a practical oriented holistic landscape ecology in the development of landscape ecology in Denmark, too.

But I am still not convinced how far we will succeed. Things are politically moving in that direction these years, so we can expect support and interest from the surrounding society, as we e.g. see it in the E. U. programmes. But it is a very ambitious agenda we have. And transdisciplinarity is extremely difficult, both from a scientific and an organisational point of view, so we will without doubt suffer a defeat or two the next years, faced with projects not fulfilling the expectations, and reactions from parts of our scientific community, trying to narrow down landscape ecology to keep it better in accordance with their own ambitions and their own possibilities of fulfilling them within their own circles. Writing the history of this new landscape ecology we have to be very much aware of the very different motives for joining it, and the necessity for all to find a proper place within it. Especially I am afraid, if different scientific disciplines coming into landscape ecology by developing spatial aspects of their discipline without problems can feel a part of the history by being integrated into a broad holistic science of the Total Human Environment. So, in a recent newsletter from the Canadian Society for Landscape Ecology, the well-known landscape ecological research at Carleton University is described in this way: "Landscape ecology in this lab means spatial ecology" (Merriam, 1995). Since mid 1970's Gray Merriam and his colleagues have made detailed studies of how landscape composition, configuration, and their derivative, connectivity, influence movements in the landscape, as a central process relating populations to the landscape. I think that all landscape ecologists agree, that what is done here by Gray Merriam and his colleagues is very important for landscape ecology, and in his paper for this morning Zev Naveh emphasises it as a good example of the innovative approaches and methods developed by landscape ecologists for the study of landscapes heterogeneity (Naveh, 1995). But how far is this school dependent on or just related to the contemporary history of landscape ecology? I am also a bit anxious, if the intentions to incorporate planning aspects, not to mention cultural aspects can be fulfilled within such an integrated all-embracing landscape ecology. Dutch landscape ecologists were leading not only in the world wide organisation of landscape ecologists, but also in the concept of integrating planning aspects. On the official letter-paper from IALE, organised by the first Dutch secretariat, it was clearly stated, that IALE exists to promote communication between scientists and planners and interdisciplinary scientific research. But in fact, it was a new trend of young planning oriented landscape ecologists - plus the grand old Family Zonneveld. It has been - and partly still is - a Dutch tradition - like a German - to restrain landscape ecology to the scientific study of the landscape, as an academic discipline, leaving planning aspects as well as cultural aspects outside (Burggraaff, Deijl, Laeijendecker, H.A. Meester-Broertjes, & A.H.P. Stumpel, 1979). This tradition is e.g. clear in the presentation of landscape ecology as given in the first chapter of the monograph of Vos and Stortelder: Vanishing Tuscan landscapes (Vos & Stortelder, 1992). When it comes to the cultural aspects, it is even unclear how to integrate it. How will a history of this part of landscape ecology look like? I think honestly, that the attempts put forward by the seminars organized by the IALE working group on cultural aspects of landscape ecology (Svobodová, 1990; Svobodová & Uhde, 1993), has not been very convincing. This is not to be seen as a critique of these activities, that in fact systematically has tried to fill out this part of the holistic approach within landscape ecology. It only shows how extremely difficult it is. My reservations concerning our common project of landscape ecology stems from studies of the history of a similar scientific project, namely geography as the science of the relation between man and the geographical environment. To explain that a bit further, I will go back to the beginning, namely the lecture of Ernst Neef on 'Stages in the development of Landscape Ecology' at the first international congress on Landscape Ecology in Veldhoven in 1981:

Here he draw up the following stages:

1. The stage of consolidation, comprising the application of the new concept to all geographical dimensions as well as the foundation of laboratories, and the development of laboratory methods.

2. The stage of theoretical foundation
3. The stage of structural analysis, the structural models
4. The stage of dynamic research with dynamic models of changing landscapes.

Typically for Neef, he emphasised, that by mastering these 4 stages landscape ecology can not only analyse specific cases, but it already allows to predict the consequences of many human activities in the landscape. Further he mentioned the following future stages:

5. The stage of stabilisation of the steadily growing field of landscape ecology
6. The stage of organisation of interdisciplinary co-operation
7. The stage of elaboration of special programs for partial systems
8. The creation of a theoretical base for synthesis: Landscape ecology could become one of the ways to a renewal of synthesis in science - the unity of scientific imagination.

I have to stress, that apart from the speech at the Veldhoven-congress, also Neef only used the term landscape ecology when referring to strict ecological (and primarily geo-ecological) oriented process studies. In fact, although he used the term back to 1961 (Neef, Schmidt, & Lauckner, 1961), he also used it very seldom.

Ernst Neef was a geographer from the former GDR, that inspired landscape geographers all over Europe during the 1970's, first of all through his main theoretical book "Die theoretische Grundlage der Landschaftslehre" from 1967 (Neef, 1967). Unsatisfied with the contemporary descriptive deductive landscape geography of the 50's (e.g. the common German work: "Naturräumliche Gliederung Deutschlands" (Meynen & Schmidhüsen, 1953)), he initiated detailed ecological oriented quantitative landscape studies (e.g. "Landschaftsökologische Untersuchungen an verschiedenen Physiotopen in Nordwestsachsen", 1961 (Neef, et al., 1961)) as empirical basis for the development of an inductive way of landscape analysis and elaborated sophisticated on such important concepts as the topological and chorological dimensions (Neef, 1963). His effort to develop an ecological and system theoretical oriented landscape science went along with interest for 'applied geography' (Neef, 1984), related to his interest for geographical aspects of the interaction between society and nature. His motive for this activity was practical, related to his engagement in planning: He was very engaged in urban planning (especially Dresden) and was deeply involved in the formulation of the Environmental Act of the former GDR (Landeskulturgesetz) from 1971, a very farsighted law, e.g. emphasising the necessity of a landscape-adapted multipurpose land-use for the solution of environmental problems, and introducing 'landscape protection areas' for the practical experimentation with this concept. The Neef-school developed not in a vacuum. In fact, he and his collaborators was very inspired by contemporary Soviet landscape geography, especially developed at the Institute of geography of Siberia and the far east, in Irkutsk, with a huge amount of scientists engaged in very extensive and detailed so-called 'structural-dynamic landscape studies', closely related to the environmental problems following the extensive resource use of the fragile Siberian ecosystems (Snytko, Semenov, & Suvorov, 1995). Writing the history of landscape ecology, it will not only be important to incorporate this Soviet history, but also to clear up the many contradictory aspects of Landscape Ecology in the former socialist societies. Because at the one side this development of a planning oriented or at least planning relevant landscape ecology, was obviously closely linked to possibilities in the central planning, and to the necessity of finding solutions for environmental problems and related land use conflicts. At the other hand the necessary integrated and holistic approach in the landscape research and the applied united geography was in clear contradiction to the dominating Stalinist interpretation of Marxist theory in this period. This was obviously a fundamental frustrating part of East European landscape ecology (and also environmentally oriented economic geographers, like G. Schmidt-Renner, H. Roos, and V. Anuchin), giving rise to serious personal problems for Neef and many other engaged landscape researchers. But I would like to ask our participants from Eastern Europe to give their opinion, whether it historically in the last end has shown up to be a hindrance for the development of landscape ecology, or if a certain 'resistance'-effect has not been beneficial for the engagement of scientists and students within the field.

At the congress in Veldhoven, Ernst Neef described landscape ecology as 'this new branch of the geo-sciences'. But obviously, he was impressed by the congress, and the tendency of enlarging the understanding of the term, and as indicated by the previous description, he was by no mean in opposition to the broad holistic project of landscape ecology that was emerging: Quite the opposite, it was just a realisation of his own ambitions for geography as a united science. Describing the actual stage 4 at that time (the dynamic research with dynamic models of changing landscapes), it was clear that such models to him was not just a question of geo-ecological models for the circulation of matter and flow of energy at the landscape level. It was also a question of transformations of innovations in society into the landscape, and the feed back from the landscape into perceptions and evaluations by society changing and developing the transformation strategies. It was the cultural landscape, a hybrid system, impossible to understand from a nature scientific point of view alone, that was in focus by Neef, not the abstract 'Naturraum'.

I am rather sure, that for Neef, landscape ecology as it emerged in Veldhoven in 1981, was a sort of reinvention of geography as a unified science, only at a higher transdisciplinary level.

Let me follow that track for a moment:

Looking at the history of geography in a very broad perspective, you can observe some very clear connections between geography and society: Geography as a science has always blossomed, when the society was in territorial expansion. This was the case in the antique Greece, the Arab expansion around 600, the time of the Great Discoveries and up to the final division of the Globe in the imperialist development up to the first world war. In these expansion époques, some simple geographical questions can be linked to the development and intensification of the use of the new territories:

1. **What is where?** A survey of resources for extensive exploitation is needed.
2. **What can be where?** The possibilities of active manipulation of the environment for productive purposes have to be investigated: E.g. do conditions for rubber plantations exist in the area.
3. **How can the complex use of and detailed adoption to the territorial conditions be optimised.** The planning and management of the territory emphasises multiple and sustainable land use as a land use intensification strategy for the improved satisfaction of human needs.

By each territorial expansion the questions begins once again, but in the development of society the relevance moves generally more and more towards the third question.

The expansion periods did not stop with the final division of the globe. The conquest of space, and the development of remote sensing techniques, have been of fundamental importance for the territorial expansion, and have put the 3 questions on the agenda once again. In fact twice. First time in the 30's, with the rapid development of air photo technology, regionally linked to expansionist ambitions, such as in Germany, and secondly with modern satellite technology widening the geographical scale and time dimensions. Also in these periods, there has been progress in the development of geography and use of geographers in the society, partly based on the use of these techniques.

But not without problems: Although we often refer to Humboldt and Ritter for the foundation of modern - especially the more integrated - geography, it has to be remembered, that geography in general was in a very bad position at their time and up to the last part of the former century. In the school, geography was mostly a ridiculous grinding of accidental or often religious oriented facts, and its representation at the universities were an exception. In the last part of the former century geographical societies were established all over the world generally with the political and ideological goal to support the nations in the ongoing division of the globe. The geographical journals of that time were popular and oriented towards colonial travel reports, but certainly with scientific ambitions. A unified approach similar to that of modern landscape ecology could often be found: As an example from the Geographical Journal of the Royal Danish Geographical Society I could mention an article of Eugene Warming from 1889 on tropical utility plants. Here the famous botanist made a comparative analysis of the sugar and cocoa production at the Virgin Islands, at that time a Danish colony. He described not only the ecology of the plants, also the production cycles, and its influence on the agricultural structure and the daily life of the agricultural population, ending up with a comparison of the social influence of the different types of production, advocating the cocoa production for ecological, social and political reasons. But generally, the scientific standard was not very high, and it was difficult to convince the scientific establishment, that geography had a scientific role to play. Chairs were established all over the world, but I think we have to admit, that it was often more because of pressure from political and other influential groups, than because of recognition among the scientific community. Whether the chair was established under science or humanities was a matter of local conditions. Certainly the progressive division of labour within science made it difficult to keep geography as a unified discipline. But I think others reasons for the missing results of this type of geography exists:

Up to the first world war, the classical 'catalogue method' for a regional geographical description developed by Humboldt and Ritter, linking physical geographical conditions to the human organisation of the territory, more and more moved towards a general theory for the relation between nature and society, namely **nature or environmental determinism**. Historically it can be seen as the price for social acknowledgement, establishing an ideological justification of the colonial system and the global status quo: The burning sun makes black people lazy, and it is the burden of the white man to bring him into the blessings of civilisation. The First World War, the decline of the colonial system, and the Russian revolution made an abrupt end of this ideology but a revival was seen again especially in Germany in the form of Geopolitics, justifying the expansionist ideology of Lebensraum.

Stalinist interpretation of Marx developed in direct opposition to the geopolitics, emphasising the human potentials under socialist conditions and neglecting constraints of geographical conditions: There was no space for such excuses for missing production results facing the coming clash between the socialist and capitalist mode

of productions. I think that the experiences from the two world wars have been the main reasons for the missing unification of geography in our time.

It is interesting to see, that the development of landscape ecology in fact fits well into the overall scheme of geography and its role in society as presented here: The first time landscape ecology was mentioned was by Carl Troll in a long article on the different possibilities for air photo interpretation, based on a world wide variety of examples. The notion comes almost *en passant* in the end of the article, summarising, that 'Air photo research is to a very high degree landscape ecology... The common goal is the understanding of the spatial ecology of the face of the earth' (Troll, 1939).

And today with the contemporary revival of landscape ecology Naveh emphasises modern remote sensing technique a main tool for a holistic global science.

But even with the twofold motivation for a unification of geography during the 70ties: The rapid development of the environmental movements and the possibilities for integrated studies through satellite remote sensing, it has been generally impossible to re-establish geography as a united discipline.

So why should it be possible for a transdisciplinary Landscape Ecology? We have to put that question.

And the most positive hopeful answer will of course be, that landscape ecology is not so burdened with the ideology of environmental determinism that hits any geographer, working on the linkage between nature and society. That is probably the reason, why so many geographers has went into landscape ecology. They have given up to battle against the myth of environmental determinism, and looks for other ways for a solution. Let me end up with another one:

A well-known academic objection against landscape ecology as a global science, is that no consistent theory comprising all aspects of this landscape ecology is to be found. However, sciences do not need to be defined theoretically according to the different spheres of knowledge. Its object or its purpose for the society can just as well define it. Medicine as the science of human health is the well-known example of an accepted science, organised outside the traditional division in nature science, social science and humanities. A global science of environment in a period of serious environmental problems could be parallel to the science of human health. That is in fact what has been proposed from Canadian landscape ecologists, arranging the 1st international symposium on Ecosystem Health & Medicine - Integrating Science, Policy and Management, in June last year. The concept has been used as a inspiration for the IALE working group on Landscape system analysis in environmental management (Moss, 1994), an fact the former working group from the International Geographical Union on Landscape Synthesis. However the health paradigm for ecosystems has also been substantially criticised with the argument, that it is a mistake for environmental scientists to treat the metaphor of health as reality: Ecosystems, or landscapes, are not organisms, do not have the properties of organisms and therefore cannot have properties such as health that organisms do have.

I will stop here with the only conclusion, that there are many histories of landscape ecology. and that we have to be very careful, when we produce them. Probably it would be useful to ask the many outsiders to write their version- those, who have a specific niche in Landscape Ecology, but are not feeling a part of the big project.

The development of Landscape Ecology in Denmark

Finally a few words on the development of landscape ecology in Denmark:

The development in Denmark cannot be linked to the European tradition of landscape ecology. Detailed geo-ecological investigations has been almost absent, and with some ecological oriented botanists as an exception, neither bio-ecological scientific traditions has been strong represented. However the study of cultural landscapes from a cultural-ecological viewpoint has had a certain tradition among geographers from the University of Copenhagen, and geologists from RUC and also Århus University has also been engaged in rather broad landscape studies. Interesting ecological oriented historical studies of landscape development has developed in the last 20 years at Odense University.

But within planning a lot of landscape ecological activities has taken place since the beginning of the 80ties. Landscape planning in Denmark is decentralised as a responsibility of the counties, which has given rise to a lot of different concepts and activities related to conservation planning and land use management. Especially after the introduction of modern bio-geography through a little booklet of Bent Muus on 'Ecological laws and conservation planning' (Muus, 1981) many planners started directly to implement different types of landscape ecological theory. Some examples of this activity will be presented Thursday afternoon. From a scientific point of view, this has however not been especially positive, since only very little research has taken place for the support of this type of planning. A centralisation of some bio-geographical research has developed within the last years under the National Environmental Research Institute that has now founded a department for landscape ecology, however in the sense of spatial ecology.

A broader research, however still related to the tradition of spatial ecology emerged in the beginning of the 80's here at RUC around the research on small biotopes, and landscape related research on environmental impact assessment has also taken its start here. Both of these themes will be presented later.

The conflict between landscape ecology as spatial ecology and landscape ecology as a holistic transdisciplinary science is very clear in Denmark. Many traditional nature scientists prefer the first interpretation. The Danish Association for Landscape Ecology advocates a broader view by arranging interdisciplinary seminars on practical landscape ecological problems (e.g. problems of the coastal zone, problems of marginalisation of agricultural areas), inviting many different disciplines and involving planners and decision-makers, too. At the same time, the growing interest on interdisciplinary research in environmental problems has been used to widen our landscape ecological research. So, in the next years, our small biotope studies will be supported by 4 different research councils for integrated studies of landscape development and landscape management in agricultural areas in co-operation with philosophers, economists, lawyers, landscape architects and others under a research program on 'Man, Landscape and Biodiversity'. But to be honest, I have not yet presented our partners with the fact, that what they are doing, will simply be - landscape ecology.

I still need the right history on landscape ecology to persuade them.

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